

# CHEMISTRY NMDCAT

(UNIT-5)

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**SAEED MDCAT TEAM**

## TOPIC

### ✓ CHEMICAL EQUILIBRIUM

- Q.1** When  $K_c$  is greater than 1, then the concentration of reactants are \_\_\_\_\_ than the products at equilibrium
- Equal
  - Less
  - Greater
  - Not predictable
- Q.2** For the following reaction  $2A_{(g)} + B_{(g)} \rightleftharpoons 3C_{(g)}$ , we can write
- $K_c > K_p$
  - $K_p - K_c = 0$
  - $K_c < K_p$
  - $K_p - K_c = -1$
- Q.3**  $K_p$  and  $K_c$  has following relationship  $K_p = K_c (RT)^{\Delta n}$ . Here  $\Delta n$  is equal to
- $n_p - n_R$
  - $n_p + n_R$
  - $n_p / n_R$
  - $n_p \times n_R$
- Q.4** Which of the following ionic compounds have same relationship of molar solubility and solubility product
- $Al(OH)_3$  and  $PbF_2$
  - $Ag_2CO_3$  and  $BaSO_4$
  - $Ca_3(PO_4)_2$  and  $Al(OH)_3$
  - $CaF_2$  and  $Ag_2CO_3$
- Q.5**  $K_c$  is independent of
- Temperature
  - Pressure
  - Both temperature and pressure
  - $K_p$
- Q.6** If  $K_{sp} = [M^{+2}]^3 [X^{-3}]^2$ , the chemical formula of compound is
- $MX_2$
  - $M_2X_3$
  - $M_3X_2$
  - $M_2X$
- Q.7** Which relationship correctly represent that precipitation occurs.
- Ionic product  $> K_{sp}$
  - Ionic product  $< K_{sp}$
  - Ionic product  $= K_{sp}$
  - None of these
- Q.8** The term common ion effect is used to describe the behavior of a solution in which \_\_\_\_\_ ion is produced by \_\_\_\_\_ compounds
- Same, different
  - Different, same
  - Same, same
  - Different, different
- Q.9**  $NaCl$  can be purified by passing  $HCl$  gas through the \_\_\_\_\_ solution of  $NaCl$ .
- Concentration
  - Dilute
  - Hot
  - Cold
- Q.10** Consider the following reaction:  
 $2SO_{2(g)} + O_{2(g)} \rightleftharpoons 2SO_{3(g)}$   
 Yield of sulphur trioxide can be increased by
- 1: Increasing pressure
  - 2: Increasing Temperature
  - 3: Adding catalyst
  - 4: Increasing concentration
- a, b
  - a, b, c
  - a, b, c, d
  - a, d
- Q.11** pH of 1M  $NH_4OH$  solution which is 10% dissociated
- 1.0
  - 10
  - 13
  - 5.0
- Q.12** Consider a reaction  $\frac{1}{2}N_2 + \frac{3}{2}H_2 \rightleftharpoons NH_3$ . Correct relation between  $K_p$  and  $K_c$  is
- $K_p = K_c (RT)^{1/2}$
  - $K_c = K_p (RT)$



c.  $K_p = K_c (RT)$

d.  $K_p = K_c \sqrt{RT}$

**Q.13** Appropriate units of  $K_p$  for the following reaction is  $2\text{SO}_{3(g)} \rightleftharpoons 2\text{SO}_{2(g)} + \text{O}_{2(g)}$

a.  $\text{mol/dm}^3$

b.  $\text{dm}^3/\text{mol}$

c.  $\text{Atm}$

d.  $\text{Atm}^2$



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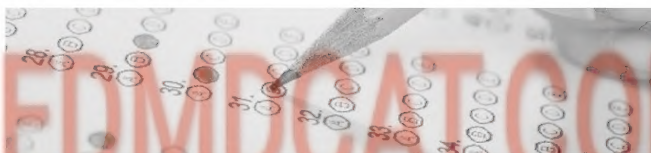


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- Q.14** pH of 0.5M dibasic acid which is 100% dissociated is  
a. 0  
b. 0.5  
c. 1  
d. 5
- Q.15** Determine partial pressure of NO at equilibrium if partial pressure of N<sub>2</sub> and O<sub>2</sub> are 2 and 8 torr respectively ( $K_p = 4.0$ )  $N_2 + O_2 \rightleftharpoons 2NO$   
a. 8 torr  
b. 16 torr  
c. 4 torr  
d. 64 torr
- Q.16** For the reaction  $A + B \rightleftharpoons C + D$  one starts with 6 moles A and 7 moles B per dm<sup>3</sup>. When equilibrium is attained, 4.5 moles of C is formed, what is the value of K<sub>c</sub> for the reaction  
a. 3  
b. 1.8  
c. 3.78  
d. 5.4
- Q.17** The unit of ionic product of water is  
a. mol<sup>-2</sup> dm<sup>-6</sup>  
b. mol<sup>-2</sup> dm<sup>-3</sup>  
c. mol<sup>2</sup> dm<sup>-6</sup>  
d. mol dm<sup>-6</sup>
- Q.18** K<sub>c</sub> value for decomposition of HF is 10<sup>-13</sup> at 2000°C it means that  
a. Reactants are more stable  
b. Products are more stable  
c. Reactants are unstable  
d. Reactants and products are equally stable
- Q.19** The equilibrium expression for reaction is  $K_c = \frac{4x^2V}{(a-2x)^2(b-x)}$  for a gaseous phase reaction then which of the following is true  
a.  $K_p = K_c$   
b.  $K_p > K_c$   
c.  $K_p < K_c$   
d.  $K_p \geq K_c$
- Q.20** Which relationship is incorrect  
a.  $pK_a + pK_b = 14$   
b.  $K_a \cdot K_b = K_w$   
c.  $K_a \propto \frac{1}{K_b}$   
d.  $K_a + K_b = K_w$
- Q.21** At equilibrium, relationship between concentrations of reactants and products  
a. [Reactants] > [Products]  
b. [Reactants] = [Products]  
c. [Reactants] < [Products]  
d. All are possible
- Q.22** pOH values of four bases are given. Which is stronger one  
a. 12  
b. 1  
c. 13  
d. 6
- Q.23** Self-ionization of water is  $H-OH \rightleftharpoons H^+ + OH^-$ . If strong base is added to water at given temperature, water will be basic and its K<sub>c</sub> will  
a. Increase  
b. First increase, then constant  
c. Decrease  
d. Remain constant
- Q.24** If K<sub>sp</sub> is equal to product of concentration of ions at particular temperature, then solution is  
a. Saturated  
b. Unsaturated  
c. Supersaturated  
d. Concentrated
- Q.25** The K<sub>c</sub> Expression of following reaction is  
 $CH_3COOH_{(aq)} + C_2H_5OH_{(aq)} \rightleftharpoons CH_3COOC_2H_5_{(aq)} + H_2O_{(l)}$   
a.  $K_c = \frac{x^2}{(a-x)(b-x)}$   
b.  $K_c = \frac{x^2V}{(a-x)(b-x)}$   
c.  $K_c = \frac{4x^2}{(a-x)(b-x)}$   
d.  $K_c = \frac{4x^2}{(a-2x)(b-2x)}$
- Q.26**  $A + B_2 \rightleftharpoons 2AB$   
If in the above reaction the value k<sub>f</sub> is 2.0 and k<sub>r</sub> is 0.1 then calculate the value of K<sub>c</sub> for reaction  
a. 2.0  
b. 20  
c. 0.1  
d. 0.05





- Q.27 Which one of the following is the strongest conjugate base**  
 a.  $\text{OH}^-$  b.  $\text{CH}_3\text{COO}^-$   
 c.  $\text{Cl}^-$  d.  $\text{C}_2\text{H}_5\text{O}^-$
- Q.28 For which of the following reactions  $K_p > K_c$**   
 a.  $\text{H}_{2(g)} + \text{F}_{2(g)} \rightleftharpoons 2\text{HF}_{(g)}$  b.  $\text{PCl}_{5(g)} \rightleftharpoons \text{PCl}_{3(g)} + \text{Cl}_{2(g)}$   
 c.  $2\text{SO}_{2(g)} + \text{O}_{2(g)} \rightleftharpoons 2\text{SO}_{3(g)}$  d.  $\text{N}_{2(g)} + 3\text{H}_{2(g)} \rightleftharpoons 2\text{NH}_{3(g)}$
- Q.29 An acid with  $K_a$  value less than 0.001 will be**  
 a. Weak acid b. Strong acid  
 c. Moderately strong acid d. Unpredictable
- Q.30 In  $\text{N}_2 + 3\text{H}_2 \rightleftharpoons 2\text{NH}_3$ , the yield of product will be minimum if**  
 a. Temperature is increased and pressure remains same  
 b. Temperature is increased and pressure is decreased  
 c. Both temperature and pressure is increased  
 d. Amount of catalyst is increased
- Q.31 The catalyst used in the Haber's process**  
 a.  $\text{V}_2\text{O}_5$  / Pt b.  $\text{V}_2\text{O}_5$   
 c. Fe d. Fe with  $\text{MgO}$ ,  $\text{Al}_2\text{O}_3$  and  $\text{SiO}_2$
- Q.32 When 1 mole of  $\text{HCl}$  is added to 1 molar aqueous solution of  $\text{H}_2\text{S}$  then**  
 a. pH of solution decreases b.  $\text{S}^{2-}$  ion concentration decreases  
 c. Ionization of  $\text{H}_2\text{S}$  decreases d. All of these
- Q.33 Correct optimum conditions for synthesis of ammonia by Haber process**  
 a. 200-300 atm,  $400^\circ\text{C}$ , Fe/ $\text{MgO}$ ,  $\text{Al}_2\text{O}_3$  and  $\text{SiO}_2$   
 b. 1-2 atm  $400-500^\circ\text{C}$ ,  $\text{V}_2\text{O}_5$   
 c. 200-300 atm,  $650^\circ\text{C}$ , Pt  
 d. 10-20atm,  $200^\circ\text{C}$
- Q.34 A pair of substances that exhibits common ion effect in aqueous solution and help to identify II-group basic radicals**  
 a.  $\text{NH}_4\text{Cl} + \text{NH}_4\text{OH}$  b.  $\text{H}_2\text{S} + \text{HCl}$   
 c.  $\text{NaCl} + \text{HCl}$  d.  $\text{KClO}_3 + \text{KCl}$
- Q.35 Which one will affect both equilibrium position and equilibrium constant**  
 a. Pressure or volume change b. Concentration change  
 c. Temperature change d. Catalyst
- Q.36  $K_{sp}$  values of four salts are given, which is least soluble in water**  
 a.  $10^{-23}$  b.  $10^{-25}$   
 c.  $10^{-20}$  d.  $10^{-21}$
- Q.37 Equilibrium constant expression for following reaction can be written as**  

$$2\text{SO}_{2(g)} + \text{O}_{2(g)} \rightleftharpoons 2\text{SO}_{3(g)}$$
 a.  $K_c = \frac{4x^2}{(a-x)V^2}$  b.  $K_c = \frac{4x^2V^2}{(a-2x)(b-x)}$   
 c.  $K_c = \frac{4x^2V^2}{(a-2x)^2(b-x)}$  d.  $K_c = \frac{4x^2V}{(a-2x)^2(b-x)}$
- Q.38 In which case, decrease of pressure favours forward reaction**  
 a.  $\text{N}_2 + \text{O}_2 \rightleftharpoons 2\text{NO}$  b.  $2\text{SO}_2 + \text{O}_2 \rightleftharpoons 2\text{SO}_3$   
 c.  $\text{PCl}_5 \rightleftharpoons \text{PCl}_3 + \text{Cl}_2$  d.  $\text{N}_2 + 3\text{H}_2 \rightleftharpoons 2\text{NH}_3$
- Q.39 The value of  $K_c$  for endothermic reversible reaction**  
 a. Increases with increase in temperature  
 b. Decreases with increase in temperature  
 c. Is independent of temperature  
 d. No prediction can be made



- Q.40** Select the buffer which is not acidic
- $\text{HCOOH}$  and  $\text{HCOONa}$
  - $\text{NH}_4\text{OH}$  and  $\text{NH}_4\text{NO}_3$
  - $\text{CH}_3\text{COOH}$  and  $\text{CH}_3\text{COOK}$
  - $\text{C}_6\text{H}_5\text{COONa}$  and  $\text{C}_6\text{H}_5\text{COOH}$
- Q.41** A buffer is prepared by mixing the solutions of equimolar acetic acid and sodium acetate. The pH should be equal to
- pKa of acid
  - Less than pKa of acid
  - Number of moles of acid
  - More than pKa of acid
- Q.42** Pure water is poor conductor of electricity. Incorrect statement about ionization of water with increase in temperature is
- Hydrogen ion concentration increases
  - pH decreases
  - $K_c$  increases
  - pOH increases
- Q.43** Solubility product of a salt AB is  $0.25 \text{ mol}^2/\text{dm}^6$ , what will be its solubility ( $\text{mol}/\text{dm}^3$ )
- 0.5
  - 0.05
  - 0.125
  - 0.025
- Q.44** pH of water at  $25^\circ\text{C}$  is 7. What is the pH at  $70^\circ\text{C}$
- $> 7$
  - $< 7$
  - $= 7$
  - $= 14$
- Q.45** Which of the following can act as both Lowry-Bronsted acid as well as base
- $\text{HCO}_3^{-1}$
  - $\text{CO}_3^{-2}$
  - $\text{SO}_4^{-2}$
  - $\text{H}_2\text{SO}_4$
- Q.46**  $2\text{HI}_{(g)} \rightleftharpoons \text{H}_{2(g)} + \text{I}_{2(g)}$
- For above reaction if  $K_c$  is 0.25, then  $K_p$  for this reaction will be
- 1.0
  - 0.25
  - 4.0
  - 0.50
- Q.47** If the difference of  $\text{pK}_a$  values of two acids is two, then acid with smaller  $\text{pK}_a$  is than other
- 2 times weaker
  - 2 times stronger
  - 100 times weaker
  - 100 times stronger
- Q.48** Following is the condition of reversible reaction that is not affected by pressure (where  $\Delta n$  = number of moles of product – number of moles of reactants)
- $\Delta n = 0$
  - $\Delta n = 1$
  - $\Delta n = -1$
  - $\Delta n = 2$
- Q.49** Incorrect expression is
- $\text{pH} + \text{pOH} = 14$
  - $[\text{H}^+][\text{OH}^-] = 10^{-14}$
  - $\text{pOH} = 14 - \log [\text{H}^+]$
  - $K_a \times K_b = K_w$
- Q.50** Equilibrium position is shifted backward by increasing temperature in all except
- $\text{N}_2 + 3\text{H}_2 \rightleftharpoons 2\text{NH}_3$
  - $\text{N}_2 + \text{O}_2 \rightleftharpoons 2\text{NO}$
  - $2\text{SO}_2 + \text{O}_2 \rightleftharpoons 2\text{SO}_3$
  - $\text{CO} + \text{H}_2\text{O} \rightleftharpoons \text{CO}_2 + \text{H}_2$

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c.  $2\text{SO}_2 + \text{O}_2 \rightarrow 2\text{SO}_3$

# Chem T-5

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